

INTERNATIONAL PRELIMINARY EXAMINATION REPORT


(PCT Article 36 and Rule 70)

Applicant's or agent's file reference Cal 85908	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/PEA/416)	
International application No. PCT/EP 03/02636	International filing date (day/month/year) 12.03.2003	Priority date (day/month/year) 20.03.2002
International Patent Classification (IPC) or both national classification and IPC C08F255/00		
Applicant POLIMERI EUROPA S.P.A.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
- These annexes consist of a total of 4 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 26.08.2003	Date of completion of this report 16.03.2004
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**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP 03/02636

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-10 as originally filed

Claims, Numbers

1-16 received on 13.02.2004 with letter of 11.02.2004

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, -- pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/EP 03/02636

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

1. Statement

Novelty (N)	Yes: Claims	1-16
	No: Claims	
Inventive step (IS)	Yes: Claims	1-16
	No: Claims	
Industrial applicability (IA)	Yes: Claims	1-16
	No: Claims	

2. Citations and explanations

see separate sheet

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/EP03/02636

None of the prior art citations discloses nor suggests the combination of the specific embodiments as claimed in the present application in order to provide functionalised polyolefins showing reduced cross linking phenomena of the substrate. Furthermore, the present process permits an effectively control of the molecular weight or the formation of microgels and branchings of the polyefins.

In particular, D1- D7 do not expressly operate under high shear conditions. None of them, except D3, are concerned with EPM or EPDM. Only D4 refers to maleic anhydride or its derivatives. None of those citations is directed to solution of the present application.

Therefore, the subject-matter of the claims is novel and inventive under art. 33 ("9 and (3) PCT.

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DT15 Rec'd PCT/PTO 1.6 SEP 2004

- 11 -

CLAIMS

1. A process for the functionalisation of polyolefins selected from:

- 5 - ethylene/propylene copolymers (EPM) with a molar propylene content ranging from 16% to 50%, and an Mw ranging from 10,000 to 200,000;
- ethylene/propylene/non-conjugated diolefin (EPDM) terpolymers with a molar ethylene content ranging from 40 to 85%, from 15 to 70%
10 of propylene and 2 to 10% molar of non-conjugated diene, the molecular weights Mw of the EPDM being within the range from 75,000 to 450,000;

15 which comprise the treatment under shear conditions higher than 100 sec^{-1} , with a polar unsaturated monomer selected from maleic anhydride and its derivatives, in the presence of at least one hydroperoxide as radicalic initiator, the concentration of hydroperoxide with respect to the
20 polyolefins ranging from 0.1 to 20% by weight.

2. The process according to claim 1, wherein the shear conditions are higher than 1000 sec^{-1} .

AMENDED SHEET

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4. The process according to claim ¹~~3~~, wherein the ethyl-
ene/propylene (EPM) copolymers have a molar propylene
content ranging from 20% to 45%.
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5. The process according to claim ¹~~3~~, wherein the ethyl-
ene/propylene/non-conjugated diolefin (EPDM) ter-
polymers have a molar ethylene content ranging from 40
to 70%, from 30 to 60% of propylene and from 0.5 to
20% of non-conjugated diene.
- 5
6. The process according to claim ⁴~~5~~, wherein the ethyl-
ene/propylene/non-conjugated diolefin (EPDM) ter-
polymers have a molar content of non-conjugated diene
ranging from 1 to 15% molar.
- 6
7. The process according to claim ⁵~~6~~, wherein the ethyl-
ene/propylene/non-conjugated diolefin (EPDM) ter-
polymers have a molar content of non-conjugated diene
ranging from 2 to 10% molar.
- 7
8. The process according to claim ⁴~~7~~, wherein the ethyl-
ene/propylene/non-conjugated diolefin (EPDM) ter-
polymers have a molecular weight Mw ranging from
100,000 to 180,000.
- 8
9. The process according to claim ¹~~8~~, wherein the non-
conjugated diolefins are selected from 1,4-hexadiene,
1,5-heptadiene, 1,6-octadiene, 1,4-cyclohexadiene, 5-
methylene-2-norbornene, 5-ethylidene-2-norbornene.
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10. The process according to claim ⁸~~9~~, wherein the non-

AMENDED SHEET

conjugated diolefin is 5-ethylidene-2-norbornene.

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11. The process according to claim 1, wherein the hydroperoxide is selected from cumene hydroperoxide, hydrogen peroxide, t-butyl hydroperoxide, 2,5-dihydroperoxy-2,5-dimethyl hexane.

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~~12. The process according to claim 1, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.1 to 20% by weight.~~

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13. The process according to claim ¹12, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.2 to 10% by weight.

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14. The process according to claim ¹¹13, wherein the concentration of hydroperoxide with respect to the polyolefins ranges from 0.5% to 5% by weight.

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~~15. The process according to claim 1, wherein the polar unsaturated monomers are selected from unsaturated carboxylic acids such as esters, amides, acids, metallic salts of acrylic acid, fumaric acid, itaconic acid, citraconic acid and maleic acid, maleic anhydride, esters of vinyl alcohol, vinyl silane derivatives, vinyl imidazole derivatives, vinyl oxazole derivatives, vinyl pyridine derivatives.~~

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16. The process according to claim 15, wherein the polar unsaturated monomers are selected from maleic anhydride and its derivatives.

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AMENDED SHEET

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17. The process according to claim 1, wherein the quantity of polar unsaturated monomers ranges from 0.1 to 10% with respect to the polyolefins.
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18. The process according to claim ¹³17, wherein the quantity of polar unsaturated monomers ranges from 0.4 to 1.5% with respect to the polyolefins.
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19. The process according to claim 1, carried out at a temperature ranging from 80 to 250°C, for a time ranging from 1 to 1800 seconds.
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20. The process according to claim ¹⁵19, wherein the temperature ranges from 140 to 200°C and the time ranges from 30 to 600 seconds.

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AMENDED SHEET